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Gopher-hills in meadows are considered a great nuisance by those who run mowers, but no complaints have been made of their injuring the meadows other than that a little grass or grain is covered up. On the other hand, it is claimed by some that much good is done in old fields by gophers, as they bring up the rich subsoil.

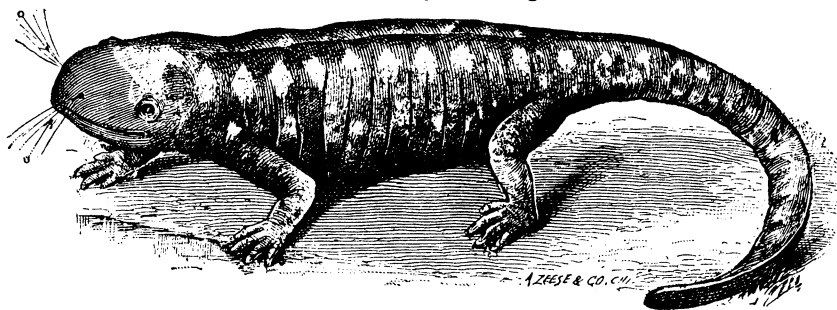
Rev. A. Clark, who lives one-half mile east of Nickerson, reports that gophers were very thick on his farm. They killed a large number of apple and cherry trees. Many of the trees were four and five years old, three inches or more in diameter, and ten feet high. One acre of hedge plants was entirely destroyed. As many as twelve gophers were seen at work at one time on less than a half-acre of hedge plants. He finally succeeded in freeing himself of the gophers by using strychnine in potatoes. He dug down and dropped poisoned potatoes in the gopher-burrows. Potatoes should be used about the size of quail's eggs or hulled walnuts; otherwise the gophers throw them out with the dirt without noticing them. The theory, as reported, is, that if the potato is too small the gopher carries it out in his pocket or pushes it out with the loose dirt; but if the potato is larger, he will take it in his mouth to remove it, and thus discover the juicy and luscious bait.

THE MODE OF RESPIRATION OF THE COMMON SALAMANDER.

(*Amblystoma mavortium*.)

BY PROF. F. H. SNOW, OF THE UNIVERSITY OF KANSAS.

In November, 1888, Mrs. F. W. Apitz presented to my biological laboratory a living specimen of the common yellow-spotted salamander (*Amblystoma mavortium*). It was kept on my table in a glass jar, and during the following winter and spring afforded an interesting subject for investigation. My attention was soon attracted to the fact that although in the final air-breathing stage of development, with fully-formed lungs and entirely deprived of external gills, this animal passed a large portion of the time in the bottom of the jar, coming to the surface of the water at



intervals of about five minutes, *apparently* for the purpose of taking in air. Subsequent examination indicated that this coming to the surface was *really* for the purpose of ejecting inspired air abstracted from the water. Not understanding how a single gulp of air could suffice for aëration for periods of such long duration, I observed more closely, and soon detected a current of water continuously entering each nostril. This double current of inward-moving water was made evident by the solid impurities of the water, which had become roiled. These were being constantly drawn into the mouth through the nostrils, with the water. I had also noticed that the salamander opened its mouth at intervals of from seven to eight seconds, and at first supposed that this indicated that the animal was becoming

oppressed for lack of air, and was therefore gasping for breath. As soon as I discovered the inward currents through the nostrils, I also detected an outward, rather than an inward, flow at each opening of the mouth. Further observation disclosed the enlargement of the throat as the mouth filled with water from the nostrils, the mouth opening to release the water, and the swelling of the throat subsiding as the mouth was closed. This operation was carried on for hours at a time, when the salamander would rise to the surface of the water, and, keeping its mouth shut, would for perhaps an equally long period breathe air directly into the lungs in the same manner as a frog. I had this specimen under my constant observation for nearly six months, and frequently called the attention of my students to its peculiar mode of respiration. I also had a second individual of this species in my laboratory in July, 1889, and found the operation repeated in every particular. An examination of the interior of the mouth of these salamanders revealed the presence of numerous ridges or folds of the mucous membrane in the palatal region, suggesting a probable respiratory function analogous to that of the gills of the same animals in the larval stage. The accompanying figure, from a drawing by my assistant, Mr. W. C. Stevens, represents the salamander reduced to two-thirds of its natural size.

CHARACTERISTIC SAND-HILL FLORA.

BY PROF. M. A. CARLTON, GARFIELD UNIVERSITY.

All along the principal river valleys of Kansas, especially over the broad valley of the Arkansas, numerous hillocks of sand are to be seen, which usually possess a very scanty vegetation. Many of these hills are at great distances from the present river-beds; the waters having long ago left them and receded to the present river-level. In such cases the flora is somewhat more abundant; but in all cases, wherever these hills may be found, so far as the writer's experience goes, the flora is in the main composed of the same species, although in some cases there may be a greater abundance of these species than in any others; and, indeed, a few forms may sometimes be added that are purely local.

I was first led to note these facts during the summer of 1888. In May of that year I made some collections in the vicinity of Wichita, among which were a species of plum (*Prunus chicasa*, Mx.), sometimes called the sand-plum, and the brilliant orange-flowered puccoon (*Lithospermum hirtum*, Lehm). The latter was found in a single locality on a sandy waste. Previous to this I had collected, on rocky points in Cloud county, a few specimens of a plum in flower which I did not recognize, not having yet seen the fruit. On returning to Cloud county and collecting the fruit, it proved to be the same *Prunus chicasa*. Then I remembered having seen the same species on various sand-hills along the Smoky Hill river in Saline county, and afterward I found it again in various places in Cloud county, but always in sandy wastes or on rocky points. Later on, while collecting near Miltonvale, Cloud county, I found, growing on a sand-hill, along with the previously mentioned plum, a number of fine specimens of *Lithospermum hirtum*. But, to my knowledge, this species does not grow on any other spot in that county, and I have made a pretty clean survey of the county.

These discoveries induced me to make further observations, the results of which are embodied briefly in this article. I simply present an account of each of the few species that have so far come under my consideration, in the order of their abundance and predominance as characteristic sand-hill species. Of course this is all, at most, only preliminary to further investigations on the same subject. I simply give